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**NORTHEAST CHURCH ROCK MINE  
INTERIM REMOVAL ACTION**

**COMPLETION REPORT**

*June 29, 2010*

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## CERTIFICATION

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Lance Haider

GE, Corporate Environmental Programs  
Designated Project Coordinator

## 1.0 INTRODUCTION

This Interim Removal Action (IRA) Completion Report provides information on removal action and results of sampling and testing completed as part of IRA activities at and adjacent to the Northeast Church Rock (NECR) Mine (the mine site). The Site is located approximately 16 miles northeast of Gallup, McKinley County, New Mexico, as shown on Drawing 1, *Cover and Index Sheet*. The original ground conditions that were present prior to the IRA construction are shown on Drawing 2, *Original Conditions*.

Removal activities were performed per the *Administrative Settlement Agreement and Order on Consent for Removal Site Evaluation (AOC)*, dated July 24, 2009, the *Interim Removal Action Work Plan, Northeast Church Rock Mine Site*, dated July 24, 2009, and the *Northeast Church Rock Mine, Interim Removal Action Construction Plan*, dated August 3, 2009. Major activities completed during the IRA include:

- Removal of soils from the NECR-1 Step-Out area with mean Radium 226 (Ra-226) concentrations above the Site Screening Level of 2.24 pCi/g (subsequently adopted and hereafter referred to as the IRA Action Level) that were potentially attributable to historic activities at the NECR mine site.
- Regrade of the side-slopes and top surface of the NECR-1 pad and consolidation of excavated materials from the NECR-1 Step-Out area on the pad. Soil cover placement on the pad and establishment of drainage controls to manage stormwater runoff from the pad.
- Temporary housing for residents of three nearby home sites.
- Investigation of Red Water Pond Road and the adjacent right-of-ways to determine which portions of this area may require removal actions.
- Seeding and fencing of areas disturbed by removal activities.

This report describes the activities performed to comply with the AOC and has been prepared to meet the requirements of the Section 33 of the AOC and referenced regulations and guidance documents. This report is organized into five Sections.

- Section 1 provides a brief introduction to the project and the activities performed.
- Section 2 describes removal activities performed in the Step-out Area and in the mine permit area.
- Section 3 presents the results of the Post-IRA Status Survey of the Step-out Area and the final status survey of the Unnamed Arroyo excavation.
- Section 4 presents the results of the Red Water Pond Road investigation.
- Section 5 provides an estimate of the total costs incurred implementing the AOC.

## 2.0 IRA REMOVAL ACTIVITIES

### 2.1 REMOVAL SCHEDULE

Removal activities were implemented between August 17, 2009 and May 21, 2010. Major earthworks were conducted between August 2009 and January 2010. Removal activities were suspended through February and March 2010 due to poor weather. Final removal activities including seeding and fencing were completed in May 2010.

### 2.2 RESIDENT HOUSING

Temporary housing was provided to residents of three households located in or adjacent to the Step-out Area as a convenience to nearby residents in consideration of potential noise and similar inconveniences associated with nearby construction activity. Temporary housing was provided from August 29, 2009 through January 18, 2010. Southwest Indian Foundation assisted GE and UNC with the temporary housing effort and provided support to the families during the removal period. Temporary housing was provided in accordance with the Temporary Housing Plan as approved with modifications by EPA on August 15, 2009 and EPA's temporary housing agreements with the residents.

### 2.3 NECR-1 STEP-OUT AREA

In August 2009, prior to removal, removal areas were delineated by AVM, Inc. Delineation of the removal boundaries was performed in accordance with the methods and procedures presented in Attachment C of the AOC. The removal boundary was recorded with a differentially corrected GPS. The final removal boundary is shown on Drawing 3, *Final Conditions* and more details of the final conditions are shown in Drawing 4, *Detailed Final Conditions Step-out Area*. Photos showing removal activities are included in Appendix A.

Prior to the start of removal activities, sediment control measures were installed as presented in the IRA Work Plan (MWH, 2009). Sediment control measures were maintained throughout removal activities and were removed following completion of seeding. Temporary access roads were established within the Step-out Area to allow transport of all impacted soils to the mine.

Access to removal areas was controlled using orange temporary snow fencing strung between t-posts. All personnel and equipment leaving the controlled area were screened, commonly referred to as frisked, for the presence of radioactive material on the hands, face and feet of personnel and tires and floorboards of equipment and vehicles. No elevated radioactive measurements were identified during the frisking process.

A total of approximately 109,800 cubic yards of soils were removed from the Step-out Area which was calculated from the pre- and post-work topographic survey of the NECR-1 Pile (see Drawings 2 and 7).

### **2.3.1 Traditional Cultural Properties**

Prior to implementing the removal action, Dinetahdoo Cultural Resource Management conducted a cultural survey of the work area. On May 15, 2009 Dinetahdoo submitted a report on the findings to Navajo Nation Historic Preservation Department (NNHPD). On June 6, 2009, the NNHPD issued a Cultural Resources Compliance Form providing notice to proceed.

One traditional cultural property (TCP) was identified during the cultural resources survey. Materials exceeding the IRA action level located adjacent to the outside of the limits of the TCP were removed on September 22, 2009. Consistent with the compliance form, an archaeologist from Dinetahdoo Cultural Resource Management (Dinetahdoo) was on site to supervise material removal within 50 feet of the TCP. An existing fence surrounding the TCP was left in place and materials within the fence were not disturbed.

A second potential TCP was identified on the top of the hillside in Zone 2 by local resident Teddy Nez during removal activities. This second TCP was located outside the removal boundary. The site was recorded by Dinetahdoo and its location was discretely marked and materials within the marked area were not disturbed.

### **2.3.2 Step-out Area Excavation and Backfill**

Excavation of materials in the Step-out Area that exceeded the IRA action level was conducted from north to south, including the access road through the Step-out Area from RWPR to the unnamed arroyo crossing. A number of methods were used to remove the material depending on the depth of removal and ground conditions in the area. Open areas with few obstacles (roads, utilities, fences, etc.) were excavated by stockpiling surface materials with dozers, loaders, or motor grader. Other areas including excavations to greater depth and/or around obstacles were excavated with an excavator. Depth of excavation varied from six inches to about eight feet in discrete areas. Areas of deeper excavation are shown on Drawing 4. Following gamma surveying and sampling, deep excavations were backfilled to the elevation of surrounding grade with material from the borrow area. Excavated materials were hauled to the NECR-1 pile and used to establish the top grade of the pile.

During work, to facilitate school bus pick-up/drop-off outside the work area, a turnout was constructed on the east side of the unnamed arroyo. Following removal, approximately six inches of road base was applied to the top of reclaimed roads and drainage swales were constructed on both sides of the road. The existing culvert at the east end of the access road near Red Water Pond Road was removed and replaced with a new culvert. Similarly, approximately six inches of road base was placed on portions of the driveways to the Nez residence that were located within the removal area and disturbed by the work.

### 2.3.3 Hillside Removal

In an effort to preserve trees, removal of materials in the hillside area was initially performed using small skid steer tractors and manually using shovels. Limbs of trees were trimmed to allow access by laborers and skid steers and a small number of trees were removed to allow access by equipment to haul excavated materials from the hillside. Trees and limbs that were removed were moved to the stockpile area located east of Pond 3, as shown on Drawing 3.

Radiological scanning following removal of material by skid steers and hand shoveling indicated that this method was not achieving the removal objective. Additional trees were removed and a small dozer (John Deere 850) was used to remove material between trees. Following removal of approximately six inches of material from around some trees, it was observed the trees were not stable against strong winds and blew down. At EPA's request, additional gamma surveying was performed and GE presented options for achieving an alternative cleanup level in this area (including the unrestricted use standard applied under the Uranium Mill Tailings Radiation Control Act or UMTRCA) that would allow the majority of trees to be preserved.

Following discussions with EPA in consultation Navajo Nation EPA, EPA instructed GE to remove the majority of the trees from the hillside and remove soils to meet the removal objectives. Navajo Nation officials concurred on this decision. All removed trees were stockpiled on the mine site. All removed soils were hauled to the NECR-1 Pile.

### 2.3.4 Petroleum Impacted Soils

Petroleum impacted soils were encountered in the southern portion of the Step-out Area near the NECR-1 pile at the locations shown on Drawing 4. Approximately 4,000 cubic yards of impacted soils were removed in connection with the effort to remove visibly impacted soil, obtain the proposed 2.5V:1H slope on the face of NECR-1, and identify the limits of the impacts. Excavated materials were placed on the mine in the Stockpile Area east of Pond 3, as shown on Drawing 3. The Stockpile Area was underlain and overlain with six mil plastic liner.

Additional investigation into the extent of petroleum impact and alternatives for remediation are being conducted outside the scope of this AOC, as presented in the November 13, 2009 (amended January 21, 2010) letter to the EPA, titled *Work Plan for Evaluating Petroleum Impacted Soils* (MWH).

## 2.4 UNNAMED ARROYO

The unnamed arroyo was excavated from the south end, starting at the Navajo Reservation boundary, and working to the north end, just past the culverts, as shown on Drawing 5, *Plan and Profile, Unnamed Arroyo*. A John Deere 460 tracked Excavator was used for the removal. At the south end of the arroyo where the excavation was the deepest, the excavator casted material onto the east bank of the arroyo where it was loaded into trucks and hauled to the NECR-1 pile where it was used to establish the top

grade of the pile. Where the excavation was shallower and trucks were able to safely approach the excavation area, the material was direct loaded into the trucks. To provide safe access for removal and haulage equipment, the east bank of the arroyo was laid back to approximately a 3:1 (horizontal:vertical) slope. The soils removed to slope the excavation were placed on the top of the NECR-1 pile. The approximate volume of material excavated from the arroyo was 33,000 cubic yards. This estimate is based on the estimated excavation dimensions at each sample location.

Once results of onsite sample analysis indicated that remaining soils on the sides and bottom of the excavation were below the field screening level, the arroyo was backfilled with soils from the borrow area. The soils were placed and compacted in accordance with the approved backfill compaction plan included in Appendix B:

Following backfill of the excavation, eight inches of bedding material and 16 inches of riprap were placed in the channel to bring it back to approximate original grade. At the request of EPA, smaller rock and gravel were placed in the arroyo to create a vehicle bypass road and a foot-path. Results of analytical and gradation testing of the riprap materials are included in Appendix C.

Three, two-foot diameter, 20-foot long culverts were installed to replace the existing single 18 inch, 15 foot long culvert where the access road through the Step-out Area crosses the unnamed arroyo (see Drawing 5). The culverts were installed in accordance with the approved IRA Work Plan (MWH, 2009). The elevation of the downstream side of the culverts was raised and a riprap apron was placed downstream to control future erosion. Approximately two feet of material was placed over the culverts and railroad ties were stacked two high at the sides of the roadway. Finally, reflectors were placed at the approaches to the crossing at both ends.

The final conditions of the unnamed arroyo are shown in plan and profile views on Drawing 5, and cross-sections across the arroyo are shown on Drawing 6, *Unnamed Arroyo Sections*.

## **2.5 NECR-1 PILE**

### **2.5.1 Demolition of Existing Structures and Concrete Pads**

Existing structures and concrete pads were demolished from August 17 through October 8. Building materials and concrete debris were hauled to the Stockpile Area located east of Pond 3, as shown on Drawing 3.

Floor tiles on some of the concrete pads were identified as asbestos containing material. Asbestos containing materials were removed between October 1 and 6, 2009 by Southwest Abatement in accordance with the Asbestos Abatement Workplan submitted to EPA on September 15, 2009 and approved by EPA with modifications on September 29, 2009. Asbestos containing material was disposed of at the EPA-approved Butterfield Station Landfill in Mobile, AZ. Asbestos removal permits and disposal manifests, providing material quantities, are included in Appendix D.

### 2.5.2 Grading of NECR-1 Pile

Grading of the NECR-1 pile occurred from August 24 through January 8, 2010. Grading included cutting of the slopes to a grade no steeper than 2.5V:1H and placing fill materials excavated from the Step-out Area and unnamed arroyo on the top surface to establish drainage from the east side of the pile to Pond 3.

Grading of the slope of the pile was accomplished using dozers and excavators. Excavators were used to remove material from the top and bottom of the pile to establish the final crest and toe. Material from the middle of the slope that could not be removed by the excavators and direct loaded into the haulage trucks was pushed to the bottom of the slope by dozers. At the bottom of the slope, this material was loaded into haulage trucks and hauled to the top of the pile. All material excavated from the slopes was placed as fill on the top surface of the pile. Approximately 22,540 cubic yards of material was excavated from the slope.

A channel was constructed with material from the borrow area along the north slope of the pile. This channel conveys runoff from the slope to a sediment pond located within the mine permit area south of the reservation boundary. The channel and sediment pond are shown on Drawing 7, *Detailed Final Conditions NECR-1*.

Materials removed from the slopes of the pile, from the Step-out Area and from the unnamed arroyo were placed on the top surface and east slope of the NECR-1 pile. These materials were used to establish a top surface grade that directs runoff from the top surface of the pile into Pond 3. Approximately 22,800 cubic yards of additional material was placed on the NECR-1 Pile above that estimated in the IRA Work Plan. To accommodate this extra material, the east slope of the pile was extended to the east and the top surface elevation was increased.

The final conditions of the NECR-1 pile, based on topographic survey performed following placement of cover material, are shown on Drawing 7. An isopach map of the cut and fill thicknesses are shown on Drawing 8, *Cut-Fill Isopach, NECR-1*, and cross-sections through the pile are shown on Drawing 9, *NECR-1 Pile Sections*.

### 2.5.3 NECR-1 Pile Cover

Following final grading of the slope and consolidated material on the top surface, the NECR-1 Pile was covered with material from the borrow area. The top surface of the pile was covered with a minimum of six inches of material and the slope was covered with a minimum of 12 inches of material. Grade stakes were used to place the cover to the required thickness. Total estimated cover volume based on the area of the slopes and top surface is 17,600 cubic yards.

## 2.6 SOIL AMENDMENT, SEEDING AND PLANTING

Following completion of the removal activities, reclamation of the disturbed areas was performed between March 25 and April 2, 2010 in accordance with the February 9, 2010 Vegetation Plan.

Areas to be seeded were first disced to prepare the seed bed. Sterile organic mulch was applied at a rate of approximately 4 tons/acre to approximately 22 acres of the Step-out Area north and west of the limit of mulch line shown on Drawing 3. Mulch was applied using a hydro-seeder. The sterile organic mulch was disced into the surface soil prior to application of seed. The 13 acres between the control berm and the reservation boundary and the top surface of the NECR-1 Pile (11 acres) did not receive mulch.

Following preparation, seed specified for broadcasting was applied using a centrifugal broadcaster attached to a tractor. Drill seed was then applied using a range land drill seeder. Seeding equipment was not able to work on the slopes of the NECR-1 Pile. The slope was seeded by hand broadcasting and then hand raking the seed into the soil. Following seeding, the six acres of the slope of the NECR-1 Pile received 2 tons/acre of hydro-straw mulch with tacifier.

Seed certificates for all seed applied are included in Appendix E. The preferred seed mix called for 0.75 lbs/acre of Alkali Sacaton which was not available at the time of seeding. Sand Dropseed, an approved alternate seed was substituted for Alkali Sacaton. The seed mix used is shown in Table 1, 2010 IRA Seed Mix.

| Common Name                | Scientific Nomenclature          | Rate (PLS lbs/ac) <sup>1</sup> | Preferred Seeding Method |
|----------------------------|----------------------------------|--------------------------------|--------------------------|
| Western Wheatgrass         | <i>Agropyron smithii</i>         | 1.50                           | Drill                    |
| Blue Grama                 | <i>Bouteloua gracilis</i>        | 0.50                           |                          |
| Galleta                    | <i>Hiliaria jamesii</i>          | 0.50                           |                          |
| Thickspike Wheatgrass      | <i>Agropyron dasystachyum</i>    | 0.75                           |                          |
| Indian Ricegrass           | <i>Oryzopsis hymenoides</i>      | 1.00                           |                          |
| Sideoats Grama             | <i>Bouteloua curtipendula</i>    | 1.00                           |                          |
| Bottlebrush Squirreltail   | <i>Sitanion hystrix</i>          | 0.25                           |                          |
| Fourwing Saltbush          | <i>Atriplex canescens</i>        | 1.00                           |                          |
| Winterfat                  | <i>Ceratoides lanata</i>         | 1.00                           |                          |
| Desert Globemallow         | <i>Sphaeralcea ambigua</i>       | 0.75                           |                          |
| Sand Dropseed <sup>2</sup> | <i>Sporobolus cryptandrus</i>    | 0.25                           |                          |
| Palmer Penstemon           | <i>Penstemon palmeri</i>         | 0.50                           |                          |
| Rocky Mtn. Penstemon       | <i>Penstemon strictus</i>        | 0.25                           |                          |
| Lewis Flax                 | <i>Linum lewisii</i>             | 1.00                           |                          |
| Wyoming Big Sagebrush      | <i>Artemisia tridentata wyo.</i> | 0.25                           |                          |
| Cliffrose                  | <i>Purshia stansburiana</i>      | 1.00                           |                          |
|                            |                                  |                                |                          |

Notes:  
<sup>1</sup> PLS = Pure Live Seed  
<sup>2</sup> Sand Dropseed was substituted for Alkali Sacaton, which was not available at time of planting

## 2.7 POST-REMOVAL SITE CONTROL

Following seeding of disturbed areas, fencing was installed around the Step-out Area, and fencing along the mine permit boundary that had previously been removed to accommodate removal activities was replaced. Merrill Fencing Company of Gallup, New Mexico performed fence construction. The purpose of the fencing around the Step-out Area is to restrict access to seeded areas by grazing animals to improve vegetative success. The alignment of the fence is shown on Drawing 3.

The fence consists of metal t-posts driven into the ground at approximately 10 foot centers. Hog wire was placed from ground level to four feet above ground. Two strands of barbed wire were installed above the hog wire. Total fence height is approximately five feet.

Sediment in the existing cattle guard at Red Water Pond Road was cleaned out and a new cattle guard was installed in the access road just east of the unnamed arroyo. The new cattle guard has an HS-20 rating. Gates were installed at the locations shown on Drawing 3. Additional gates were installed adjacent to the cattle guards to allow the cattle guards to be bypassed if required.

## 2.8 ENVIRONMENTAL MONITORING

Environmental monitoring performed during removal activities included air monitoring of internal and external radiation dose using Eberline RAS air samplers, Track Etch monitors for monitoring of Radon exposure, environmental thermoluminescent dosimeters (TLD) for monitoring of external radiation dose, and Dustrack monitors for respirable dust monitoring. Results of environmental monitoring are included in Appendix F and are summarized below. All radiological monitoring results were below the action levels presented in the IRA Work Plan (MWH, 2009). On two occasions PM<sub>2.5</sub> respirable dust data were above the actions levels. These data points coincide with the burning of garbage upwind of the monitor at a nearby residence, and as such were unrelated to the IRA activity or to historic mining impacts.

- External radiation dose was monitored continuously throughout the project at one upwind and two downwind locations and the total dose over the entire period was totaled. The dose limit for individual members of the public, as established in the IRA Work Plan, was 100 millirem (mrem). Total dose at the upwind location was 11.3 mrem, at the downwind station located near the residence in the Step-out Area it was 19.2 mrem, and at the downwind station located at the north end of the Step-out Area it was 11.0 mrem.
- Respirable dust was measured during working hours each working day. Respirable dust standards were based on the EPA's Primary National Ambient Air Quality Standards at 24 hour Time Weighted Average (TWA) of 150 micrograms/cubic meter ( $\mu\text{g}/\text{m}^3$ ) for PM<sub>10</sub> and 35  $\mu\text{g}/\text{m}^3$  for PM<sub>2.5</sub>. Summary data are presented in Table 2, *Dust Monitoring Data Summary*.

| TABLE 2<br>DUST MONITORING DATA SUMMARY |               |  |         |         |
|---|---------------|--|---------|---------|
| Station                                 | Particle Size | Concentration ( $\mu\text{g}/\text{m}^3$ ) |         |         |
|   |               | Average                                    | Minimum | Maximum |
| Down Wind N                             | PM10          | 0.012                                      | 0.000   | 0.339   |
|   | PM2.5         | 0.007                                      | 0.000   | 0.134   |
| Down Wind W                             | PM10          | 0.014                                      | 0.000   | 0.383   |
|   | PM2.5         | 0.010                                      | 0.000   | 0.225   |
| Up Wind                                 | PM10          | 0.007                                      | 0.000   | 0.366   |
|   | PM2.5         | 0.004                                      | 0.000   | 0.027   |

- Internal exposure was monitored three days per week using an Eberline RAS-2 sampler. The action level for internal exposure was established as 25 percent of the Annual Limits of Intake (ALI) established by the Nuclear Regulatory Commission (NRC) in 10 CFR 20. Summary data of internal exposure monitoring are presented in Table 3.

| TABLE 3<br>INTERNAL RADIOLOGICAL EXPOSURE DATA SUMMARY |  |         |         |         |         |
|--|--|---------|---------|---------|---------|
|  | Airborne Particulate Activity ( $\mu\text{Ci}/\text{ml}$ ) |         |         |         |         |
|  | Gross Alpha  | U-nat   | Ra-226  | Th-230  | Pb-210  |
| ALI (Limit)  | 1.8E-12  | 9.0E-13 | 9.0E-13 | 2.0E-14 | 6.0E-13 |
| Action Level, 25% of ALI                               | 4.5E-13  | 2.3E-13 | 2.3E-13 | 5.0E-15 | 1.5E-13 |
| Mean, Downwind   | 1.9E-14  | 9.4E-15 | 4.7E-15 | 4.7E-15 | 3.7E-15 |
| Mean, Upwind   | 1.5E-14  | 7.6E-15 | 3.8E-15 | 3.8E-15 | 3.0E-15 |
| Mean, Net (Downwind minus upwind)                      | 3.5E-15  | 1.8E-15 | 8.9E-16 | 8.9E-16 | 7.1E-16 |
| Mean % of ALI, Net                                     | 0.20%  | 0.20%   | 0.10%   | 4.43%   | 0.12%   |
| Max (Net)  | 2.3E-14  | 1.1E-14 | 5.7E-15 | 5.7E-15 | 4.6E-15 |
| Max, % of ALI, Net                                     | 1.3%   | 1.3%    | 0.6%    | 28.5%   | 0.8%    |

Additional monitoring was provided to on-site workers to evaluate potential health and safety concerns specific to construction activities. Monitoring results are summarized below and indicate that criteria established within the EPA-approved safety plans for the project were met.

- Entrance and exit bioassays of uranium in urine were collected from site personnel and analyzed for total uranium. Analysis of results showed dose-producing intakes of uranium did not occur during project work.
- External radiation monitoring using TLD badges was performed for all site workers. The maximum individual exposure over the six months of site work was

8 mrem with a cumulative dose for all site workers of 48 mrem. The individual annual dose limit for a radiation worker is 5,000 mrem per year.

- Breathing zone air monitors were worn by four representative employees from the start of construction through the end of October 2009. Employees wearing the monitors varied from day to day and included laborers, operators and drivers. Filters from the breathing zone monitors were analyzed for alpha and beta emissions at the end of the day. The maximum dose recorded from the breathing zone monitors was 0.23 mrem for the day with an average dose for the group of 0.035 mrem/day. The maximum occupation annual dose for workers is 5,000 mrem per year or (approximately 100 mrem/day) combined from internal and external radiation exposures.
- Radioactive contamination monitoring, also called frisking, of equipment and personnel was performed at all site exits prior to personnel or equipment leaving the controlled work area. No elevated radioactive measurements were identified during the frisking process.
- On-site fugitive dust was monitored throughout removal activities. The dust monitor was setup within the active work area on the top surface of the NECR-1 Pile. The daily average never exceeded 1 mg/m<sup>3</sup> during removal activities, only six readings fell between 1 and 5 mg/m<sup>3</sup>, and no readings exceeded 5 mg/m<sup>3</sup>, the action level established for suspension of construction activities.

### 3.0 POST-IRA STATUS SURVEY

This section summarizes the results of the Post-IRA Status Survey of the Step-out Area and Final Status Survey of the Unnamed Arroyo conducted at the conclusion of IRA excavation activities. The surveying activities and the results of the statistical analysis are presented in detail in the report *Post-IRA Status Survey, Interim Removal Action* (MWH, 2010), which is included Appendix G. The status survey consisted of gamma surveying, soil sampling and analysis, and development of a revised and more accurate correlation between gamma measurements and equivalent Ra-226 concentrations. The Post-IRA Status Survey of the Step-out Area was conducted in accordance with the *Interim Removal Action Work Plan* (MWH, 2009), and the Final Status Survey of the arroyo was conducted in accordance with the *Work Plan for Final Status Survey of the Unnamed Arroyo* (MWH, October 2009).

The results of the gamma surveying and the soil analyses from the Step-out Area and unnamed arroyo show that the IRA of the unnamed arroyo meets the MARSSIM release criterion for the IRA action level. They also show that the IRA of the Step-out Area meets the MARSSIM release criterion for the IRA action level. As discussed in Appendix G, consistent with MARSSIM, the results exceeding the  $DCGL_{EMC}$  were evaluated to assess if there are potentially any areas of elevated residual radioactivity that might result in a dose or risk exceeding the release criterion. The results of the gamma surveys and soil sampling confirmed that only a few small areas exceed the  $DCGL_{EMC}$  and statistical analysis of all the survey and soil sampling results confirm that MARSSIM release criterion has been achieved for the step-out area.

#### 4.0 CHARACTERIZATION OF RED WATER POND ROAD

Characterization of Red Water Pond Road (RWPR) took place from September 8 to 11, 2009. A detailed report including drawings presenting the characterization activities and results was submitted to EPA on January 26, 2010, *Removal Site Evaluation Report, Red Water Pond Road*, and is included in Appendix H. The results of the investigation conducted in the Study Area along RWPR indicated the following:

- Surface static gamma measurements collected during both the Supplemental RSE (SRSE) and the RWPR RSE, reported as equivalent Ra-226 concentrations using the SRSE correlation, exceeded the FSL at 100% of the locations within the 50-ft buffers and the roadway; all but four exceeded 3.0 pCi/g.
- Surface soil Ra-226 concentrations were greater than the FSL at 100% of the locations within the 50-ft buffers.
- Subsurface soil Ra-226 concentrations were less than the FSL at 100% of the locations (1 to 6 ft bgs) within the roadway.
- Subsurface soil Ra-226 concentrations were less than the FSL at all locations within the 50-ft buffers, except four test pits located along the northern portion of RWPR within approximately 600 feet of the east-west arroyo crossing to the Quivira Mine.

These results do not change the conclusions of the February 2009 statistical evaluation of the previous RSE gamma survey and surface soil data sets. The results of the evaluation indicated that the mean/median of the data for both the southern and northern sections of RWPR are statistically higher than adjacent areas immediately to the west in the NECR-1 Step-out Area. Overall, the results offer further indication that RWPR and the immediate buffer areas on either side of the roadway were likely impacted by historic use of the road by the operators of the Quivira Mine and subsequent disturbance of historic material by wind, water or vehicular traffic. Due to the proximity of NECR to the southern portion of RWPR and based on local drainage patterns in this area, past operations at the NECR site could also have caused some impact along the southern portion of the Study Area in addition to impacts from past use of RWPR as a haul road for the Quivira Mine. Impacts from NECR are considered unlikely to extend beyond the small drainage that crosses the central portion of the Study Area. Impacts along the northern portion of the Study Area are likely associated with the Quivira Mine due to the proximity of the mine, past use of RWPR as a haul road, and the potential for ongoing road use and maintenance to transport materials from the north side of the east-west arroyo into the Study Area.

Based on the results of the Weston investigation and the RWPR RSE results from the northern portion of RWPR, further investigation of the continuing impacts to RWPR from the adjacent Quivira Mine may be appropriate. Unless the continuing impacts to RWPR from the area north of the east-west arroyo and adjacent to the Quivira mine are

addressed, any removal action conducted on RWPR is likely to only be temporarily effective.

## 5.0 ESTIMATE OF COSTS INCURRED

Estimate of costs incurred complying with the AOC is approximately \$4.2 million. This includes costs to negotiate the AOC, prepare a design and work plans, removal, removal oversight, sampling and monitoring, and project management. This does not include costs incurred by EPA and its contractors and consultants.

**DRAWINGS**

**APPENDIX A**  
**REMOVAL ACTION PHOTOS**

**APPENDIX B**

**METHOD SPECIFICATION FOR COMPACTION OF BACKFILL  
MATERIAL IN THE UNNAMED ARROYO**

**APPENDIX C**  
**RIPRAP QUALITY AND GRADATION DATA**

**APPENDIX D**  
**ASBESTOS REMOVAL AND DISPOSAL DOCUMENTATION**

**APPENDIX E**  
**SEED CERTIFICATES**

**APPENDIX F**  
**ENVIRONMENTAL MONITORING DATA**

**APPENDIX G**  
**POST-IRA STATUS SURVEY RESULTS**

**APPENDIX H**  
**REMOVAL SITE EVALUATION REPORT, RED WATER POND ROAD**